

Strength Properties of Steel/Aluminum Dissimilar Spot Welded Joint

- (Second Report) Investigation of Fatigue Strength -

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In spot welding between steel sheets and aluminum alloys, it is well known that the intermetallic compound formed at the joint interface is closely related to the joint strength. In this study, we fabricated welded joints with protrusion-like structures to overcome the brittleness of intermetallic compounds in spot welding between steel sheets and an aluminum alloy sheet. The fatigue strength of the welded joints was investigated.

In this experiment, as in our previous report, three sheets were stacked and spot-welded: a 1.2 mm-thick aluminum alloy sheet (equivalent to A6022-T4), a 0.75 mm-thick 270 MPa-class galvanized steel sheet, and a 1.4 mm-thick 440 MPa-class cold-rolled steel sheet. Tensile-shear fatigue tests and L-shaped peel fatigue tests were then performed.

Fig. 1 shows the load-range versus number-of-cycles-to-failure chart obtained from the tensile-shear fatigue tests, and Fig. 2 shows the load-range versus number-of-cycles-to-failure chart obtained from the L-shaped peel fatigue tests. Photographs of the fractured specimens are also included in the figures.

From these results, the following findings were obtained:

- For tensile-shear fatigue strength, the fracture mode depended on the load level. At high load levels, cracks propagated within the spot weld, producing a fracture mode characterized by crack growth inside the spot. At low load levels, the fracture mode was characterized by separation of the aluminum alloy sheet through its thickness.
- For L-shaped peel fatigue strength, the fracture mode was characterized by through-thickness failure of the aluminum sheet.

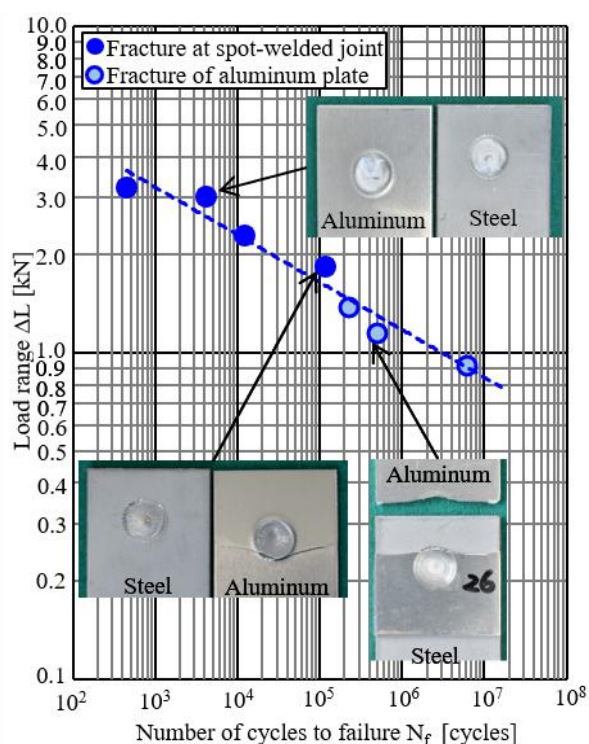


Fig.1 Result of tensile shear fatigue test

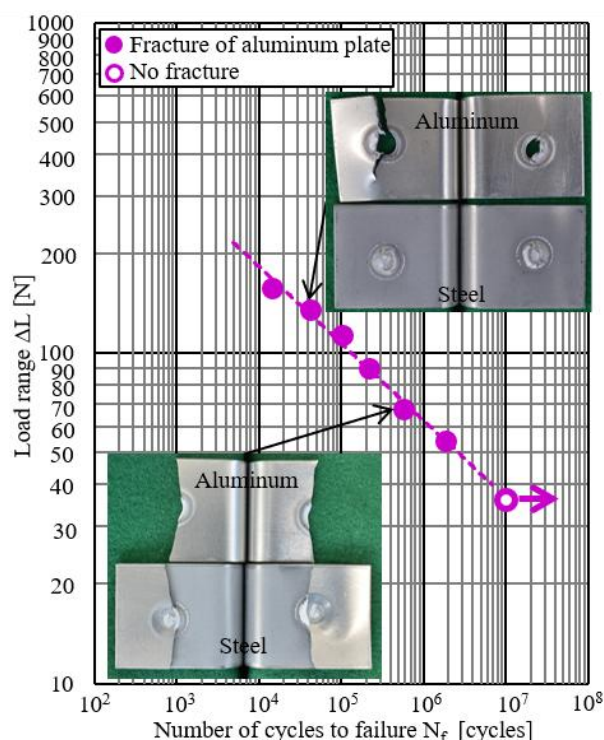


Fig.2 Result of L-shaped peel fatigue test